United States
Department of
Agriculture

Marketing and
Regulatory
Programs

Animal and
Plant Health
Inspection
Service

Mexican Fruit Fly Cooperative Eradication Program

El Cajon, California

Environmental Assessment, July 1998

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I. Introduction

This environmental assessment analyzes the potential environmental consequences of alternatives for the eradication of a Mexican fruit fly infestation in San Diego County, California. The Mexican fruit fly, *Anastrepha ludens* (Loew), is a major pest of agriculture throughout many parts of the world. Because of its wide host range (over 40 species of fruits) and its potential for damage, eradication programs have been implemented in the past to prevent it from becoming a permanent pest on the U.S. mainland.

A permanent infestation of Mexican fruit fly would be disastrous to agricultural production in California and the United States. The Mexican fruit fly is an exotic insect native to central Mexico. Commercial crops, as well as home production of host fruits, would suffer if the Mexican fruit fly were allowed to remain. Fruit that has been attacked by Mexican fruit fly is unfit to eat because the Mexican fruit fly larvae tunnel through the fleshy part of the fruit, damaging the fruit and subjecting it to decay from bacteria and fungi.

Adult Mexican fruit flies were detected in the area of El Cajon, San Diego County, California, beginning on July 20, 1998. The detections were in a residential area with backyard host plantings. Because of the successive detections of the pest, an infestation of the pest was determined to exist.

II. Purpose and Need

The Mexican fruit fly infestation recently detected in the area of El Cajon, San Diego County, California, represents a major threat to the agriculture and the environment of California and other U.S. mainland States. The U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), and the California Department of Food and Agriculture (CDFA) are proposing a program to eradicate that infestation. The eradication program would be in response to a very small, localized outbreak of Mexican fruit fly.

APHIS' authority for cooperation in the program is based upon the Organic Act (7 United States Code (U.S.C.) 147a), which authorizes the Secretary of Agriculture to carry out operations to eradicate insect pests, and the Federal Plant Pest Act (7 U.S.C. 150dd), which authorizes the Secretary of Agriculture to use emergency measures to prevent dissemination of plant pests new to or not widely distributed throughout the United States.

III. Alternatives

A. No Action

Under this alternative, APHIS would not participate in efforts to eradicate the current infestation of the Mexican fruit fly in San Diego County. An eradication program could proceed through the efforts of State and county governments, but the lack of Federal involvement would probably prevent timely and/or adequate implementation of the program. This could result in delays in achieving eradication, expansion of the infested area, and permanent establishment of the Mexican fruit fly. The adverse environmental effects of this alternative would at least equal those for alternatives with Federal involvement if the eradication efforts were successful. The delay and lack of Federal funding would most likely result in expansion of the infested area with increased environmental impacts commensurate with the size of infestation. Establishment of Mexican fruit flies would lead to increased crop and backyard produce damage and uncoordinated use of insecticides by commercial growers and individual residents, with increased environmental risk associated with these applications.

B. Chemical Control

Under the chemical control alternative, the control of Mexican fruit fly would be accomplished solely through the application of chemical pesticides to the infested areas and the infested commodities, such as plants and fruits. This could include routine aerial and/or ground malathion bait spray applications on a 6- to 14-day interval and diazinon soil treatments on a 6- to 14-day interval. Methyl bromide fumigations, diazinon soil treatments, and malathion bait spray applications would also be required in the regulation of fresh Mexican fruit fly host produce and nursery stock grown within the quarantine area. The use of only chemicals to eradicate Mexican fruit fly would preclude the use of several environmentally safe and effective control methods, such as sterile insect release and fruit stripping. Use of auxiliary nonchemical methods allows a reduction in the number of applications of chemical pesticides, while maintaining program efficacy. The increased application of chemicals using this alternative poses increased risk of adverse impacts from the hazards to human health and nontarget species than the risks resulting from an integrated pest management approach.

C. Integrated Pest Management (Preferred Alternative)

Under integrated pest management (IPM), any or a combination of control methods would be used, based on site-specific requirements that take into account program efficacy and environmental considerations. IPM may include the use of both chemical and nonchemical methods in a timely manner to achieve the program goal and minimize potential environmental consequences that could arise from program activities. This is the preferred alternative, from both program and environmental perspectives.

Under IPM, this program could use any or a combination of the following methods: chemical control, sterile insect technique, physical control, cultural control, male annihilation, and regulatory control. Biological control and biotechnological control also were considered, but have not yet been proven efficacious or technologically feasible. The eradication program is likely to consist of one or more applications of malathion bait spray prior to the release of sterile Mexican fruit flies. The malathion bait spray may be applied by aerial or ground application at 6- to 14-day intervals. Diazinon will be drenched with water into the soil within the drip line of plants with fruit known or suspected to contain Mexican fruit fly larvae. Other Mexican fruit fly control options include the use of mass trapping, host removal, and regulatory control. Regulatory control involves quarantine of fresh produce and commodities from host plants of Mexican fruit fly. Specific regulatory treatments are required for transport of produce grown within the designated quarantine area to destinations outside this regulated area. The treatment of produce and nursery stock may involve malathion bait spray applications, diazinon soil treatments, or methyl bromide fumigations.

There are potential adverse environmental impacts from the use of chemicals in IPM, but these impacts are less than in the other alternatives. The restricted use of chemicals in IPM results in less adverse environmental effects than a program limited to chemical control or no action. The magnitude of chemical pesticide use in the other alternatives would equal or exceed the amount used in IPM and would result in more adverse environmental effects.

IV. Affected Environment and Potential Environmental Consequences

A. Affected Environment

The affected environment includes areas of San Diego County, California, that are encompassed by the program's eradication and quarantine zones. The current eradication zone (where eradication treatments will occur) is the area including and immediately surrounding the Mexican fruit fly detections—an area of approximately 9 square miles (fig. 1). The current quarantine zone (where regulatory treatments may be required) includes the eradication zone and extends farther, for a total area of approximately 73 square miles. The quarantine area includes portions of El Cajon and Glenview.

In past eradication programs, additional detections occasionally have resulted in program expansion (expansion of eradication and quarantine zones). Minor expansion of the program should not result in the need for further analysis, unless unique and different factors (e.g., endangered or threatened species) are found in the new area. Major expansion of the program area would probably result in the need for additional analysis.

The current program area is urban and suburban in character. Accordingly, humans, domestic animals, wildlife, and plants may be found in the program area. Cleveland National Forest is located to the east. Sweetwater River is located to the south just outside the eradication zone. Silverwood Wildlife Sanctuary is located to the northeast of the eradication zone.

Section 7 of the Endangered Species Act of 1973 (ESA) requires Federal agencies to consult with the U.S. Department of the Interior, Fish and Wildlife Service (FWS), if species listed or proposed for listing are likely to be adversely affected. The CDFA has contacted FWS, who has advised that no endangered or threatened species are known to exist within the current eradication zone. However, endangered and threatened species occur in other parts of San Diego County. If the program expands into other areas of San Diego County, and if there is a potential for affecting federally listed or proposed endangered and threatened species, APHIS will consult with FWS over protective measures that may be required.

B. Potential Environmental Consequences

The analysis of potential environmental consequences will consider the alternatives of no action, chemical control, and integrated pest management. Because the principal environmental concern over this program relates to its use of chemical pesticides, this assessment will focus on the potential environmental consequences of the pesticides on human health, nontarget species, and endangered and threatened species.

Consistent with Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” APHIS considered the potential for disproportionately high and adverse human health or environmental effects on any minority populations and low-income populations. In particular, APHIS considered potential effects of the program to nearby Indian lands including Sycuan Indian Reservation, Barona Ranch Indian Reservation, and Capitan Grande Indian Reservation. No disproportionate effects on such populations are anticipated as a consequence of implementing the preferred alternative.

1. No Action

Under the no action (no APHIS effort) alternative, Mexican fruit fly control would be left to the State, grower groups, or individuals. Without a coordinated APHIS effort, including use of control methods not generally available (e.g., sterile insects), it is likely that the Mexican fruit fly infestation would spread to other areas of California and the U.S. mainland. Any response to control such an expanded infestation by individuals or organizations would probably result in a greater magnitude of environmental impact than would be associated with a coordinated APHIS/State eradication program. Under those conditions, any available controls (including more hazardous chemical pesticides) could be used, resulting in greater environmental impact than is associated with the action alternatives analyzed within this assessment.

a. Human Health

Under the no action alternative, private homeowners and commercial growers would have few options other than pesticides to reduce the Mexican fruit fly damage to their crops. Any pesticides registered for use could be applied in an unsupervised and uncoordinated manner. Accordingly, greater pesticide amounts and higher frequencies of application are likely to be used than would be expected with a coordinated, cooperative government program. In addition to the direct toxic effects of those pesticides, humans could also be affected by cumulative impacts resulting from synergistic effects of combining various pesticides for use against Mexican fruit fly. Human exposure to pesticides and resulting adverse consequences probably would be greater than if pesticides were applied in a cooperative government program.

The spread of the Mexican fruit fly infestation will reduce the amount of locally available produce and may restrict the fruit consumption of some members of the public. Some members of the public may depend upon this source of fruit as a substantial portion of their diet.

b. Nontarget Species

Broader pesticide use resulting from lack of APHIS effort to combat Mexican fruit fly would increase the pesticide load to the environment and, therefore, increase the probability of effects to nontarget species. The potential expansion and establishment of the pest also would have unknown effects on insect community structure and on predators in those systems.

c. Endangered and Threatened Species

Further expansion of Mexican fruit fly's range would be likely to include endangered and threatened species habitats, with unquantified risk to those species from uncoordinated pesticide use. No adverse impacts to endangered or threatened species would result directly from APHIS' implementation of the no action alternative.

2. Chemical Control

The chemicals proposed for use under this alternative include malathion bait spray, diazinon, and methyl bromide. Although registered by the U.S. Environmental Protection Agency (EPA) for domestic uses, these pesticides are not currently registered for use against Mexican fruit fly because it is an exotic pest that does not regularly require treatment here. Special registration procedures are required for pesticides used against exotic pests, such as the Mexican fruit fly which is not native to this country. A section 18 (emergency) or section 24c (special local needs) exemption under the Federal Insecticide, Fungicide, and Rodenticide Act allows their use.

Because of the limited and restricted nature of the control actions necessary in this program, it has been analyzed within the framework of an environmental assessment.

Three major factors influence the risk associated with pesticide use: fate of the pesticide in the environment, its toxicity to humans and nontarget species, and the exposure of humans and nontarget species to the pesticide. These factors will be evaluated for each of the chemicals analyzed.

a. Malathion Bait Spray

(i) Fate

Malathion is an amber-colored liquid that is combined with a protein bait to form a sticky spray. The formulation used in the program is 0.175 pounds of active ingredient per acre mixed with 9.6 fluid ounces of protein hydrolysate bait per acre, for both aerial and ground applications. The half-life of malathion in soil or on foliage ranges from 1 to 6 days; in water, from 6 to 18 days. Malathion bait spray is applied from the ground, generally as a spot treatment to individual trees, or from the air. Trees, shrubs, and other surfaces such as soil, roads, and ponds are likely to receive spray from aerial applications, although efforts are made to avoid directly spraying water bodies including the use of buffers. Malathion is generally of more concern in aquatic areas because of its high toxicity to aquatic organisms.

(ii) Toxicity

Malathion is an organophosphate that acts by inhibiting acetylcholinesterase. Mildly acutely toxic, malathion is classified by EPA as category III (Caution) based on oral, dermal, and inhalation exposure routes. Toxic effects from malathion may include headache, nausea, vomiting, blurred vision, weakness, and muscular twitching at high doses. In humans and other mammals, metabolism by one degradation pathway leads to the formation of malaoxon, a more potent cholinesterase inhibitor than malathion. The more common degradation pathways yield nontoxic intermediates.

Although malathion has not been determined to be a carcinogen in rats, additional data on malathion and malaoxon are equivocal and studies are ongoing. More information is needed to determine the neurotoxicity of malathion (EPA, 1988). Malathion may have synergistic effects when used with other pesticides.

Oral doses of malathion are slightly to moderately acutely toxic to mammals and birds (table 1). Signs of poisoning are similar to the reactions of humans. Malathion is highly toxic to some forms of aquatic life, including invertebrates, amphibians, and fish (table 2). The EPA has established a chronic water quality criteria of 0.1 μg/L (micrograms per liter) for protection of freshwater and marine aquatic life. Fish kills that may have been associated with aerial malathion bait spray applications have been documented.

Table 1.
Acute Oral LD_{50}s[1] for Selected Species Dosed with Malathion (mg/kg)[2]

Mouse	720 - 4,060
Female rat	1,000
Male rat	1,375
Mallard	1,485
Pheasant	167

[1] LD_{50} = Lethal dose for 50% of animals treated

Table 2.
Malathion 96-hour LC_{50}s[1] for Selected Aquatic Species (μg/L)

Tadpole	200
Rainbow trout	4.1 - 200
Bluegill	20 - 110
Daphnia	1 - 1.8
Stone flies	1.1 - 8.8

[1] LC_{50} = Lethal concentration for 50% of animals treated

(iii) Exposure and Risk

Human Health

Potential exposure to humans is by dermal absorption, inhalation, or ingestion of residues. Due to the potential for aerial application of malathion bait spray, dermal absorption from direct application or contact with treated surfaces is the primary exposure route for the public. Public exposure from a ground malathion bait spray application will be smaller than exposure from an aerial application because less area is treated and less pesticide is used. Workers, such as ground applicators and the ground crew for aerial applications, may have inhalation exposure as well as dermal exposure.

Results of the quantitative risk assessment prepared for the Medfly Cooperative Eradication Program Environmental Impact Statement (EIS), whose analysis of malathion impacts also applies to Mexican fruit fly programs, suggest that exposures to pesticides from comparable program operations are not likely to result in substantial adverse human health effects. Residues on commodities or backyard fruits resulting from the malathion bait spray application are unlikely to greatly increase exposure to the consuming public. Malathion concentrations on vegetation estimated by the California Department of Health Services (Kizer, 1991) indicate that levels of malathion on vegetation are not likely to exceed the residue tolerance levels set by EPA. Residue tolerances for malathion on many food items are established (40 CFR 180.11) and most are 8 ppm (parts per million). The provisional acceptable daily intake is 0.02 mg/kg per day.

The human health risks of comparable treatments are evaluated quantitatively in the Medfly Cooperative Eradication Program EIS. Results suggest that exposure from normal program operations will not present a human health risk either to workers or the public. In addition, risks to humans have been analyzed qualitatively, with reliance on information from past fruit fly eradication programs in California. The exposure scenarios from previous fruit fly eradication efforts will not differ substantially from the current program.

Nontarget Species

Malathion bait spray will kill insects other than the Mexican fruit fly. Malathion is highly toxic to bees, and direct application to areas of blooming plants can be expected to result in a high bee kill. Although malathion is not phytotoxic, there could be potential indirect effects on plant populations due to lower pollination rates if bee or other pollinator populations are reduced. This is a concern of aerial application. Secondary pest outbreaks have occurred concurrently with the use of aerial applications of malathion bait spray, but have not been determined conclusively to be associated with the applications.

In 1981, fish kills also occurred from a similar treatment method. Since then, the State of California has instituted procedures to reduce the likelihood of fish kills. None have been known to occur from aerial applications of malathion bait spray since the procedures were implemented.

Terrestrial animals are exposed to malathion primarily through dermal and oral routes. Ingesting prey containing residues, rubbing against treated vegetation, and grooming contribute to total dose. Aquatic species can be exposed to direct application and runoff. Exposure of malathion bait spray by aerial application poses high risk to nontarget invertebrates and some aquatic species. Some insectivores may be affected. Ground application of malathion bait spray has far fewer environmental consequences because the treated area is smaller and delivery is more accurate. Fewer species would be exposed and thus the treatment poses less total risk to nontarget species than does aerial application.

Endangered and Threatened Species

Although the FWS has said that no endangered or threatened species are found within the current program eradication zone, several endangered or threatened species are found in San Diego County. If the program were to expand and if the range of federally listed species and the treatment area overlapped, protective measures may be required to protect species from adverse environmental consequences of the program. The species that may be affected by control efforts are dependent upon the control methods used (i.e., not all control methods affect all species equally). Thus, protective measures will vary depending on the control method being used and the species found within the treatment area.

Malathion bait spray is not selective for Mexican fruit fly alone. Ingestion of bait/malathion and cuticular exposure to malathion by insects other than Mexican fruit fly could result in their deaths. If their habitats overlapped with the program treatments, those species could be adversely affected by aerial application of malathion bait; thus, elimination of aerial application is a protective measure.

Additionally, repeated aerial sprays of malathion bait generally would reduce insect numbers. Reduction of insect populations could reduce pollinator species for threatened and endangered plants, and would reduce potential food resources for endangered and threatened insectivores. Malathion is highly toxic to many aquatic species, both vertebrate and invertebrate, and spray drift could result in aquatic system disruption. The ecosystem is resilient enough to absorb some reduction in nontarget populations and the resultant food web effects, but the severity of the reductions would increase with increased applications of malathion. Many of the endangered and threatened species in San Diego County are dependent upon aquatic habitats. Loss of a single individual of a listed species from program activities would be a violation of ESA. Thus, aerial application of malathion bait spray should be controlled both within the range of endangered and threatened insect-pollinated plants (especially annuals) and in aquatic habitats.

b. Diazinon Soil Treatments

(i) Fate

Technical grade diazinon is a sweet, aromatic, amber-brown liquid. The program formulation is applied at a rate of 5 pounds active ingredient per acre. Its half-life in soil ranges from 1.5 to 10 weeks and in water at neutral pH ranges from 8 to 9 days . Small amounts of diazinon are used to treat soil within the drip line of trees that have fruit infested with Mexican fruit fly larvae. Surface vegetation may retain residues and, depending on soil type, local hydrology, and topography, diazinon may occur in runoff water.

(ii) Toxicity

Although diazinon is widely used and generally is not considered a hazard to human health under its registered uses, it can be toxic to humans. EPA has classified the formulation of diazinon as category II (Warning) for program use in soil treatment. Although not a primary dermal or eye irritant, it can be absorbed through these routes and, at high concentrations or prolonged exposure, causes severe irritation.

The mode of toxic action of diazinon occurs through inhibition of the enzyme, acetylcholinesterase. Symptoms of poisoning in humans, who are much less susceptible to the effects of diazinon than insects, include dizziness, headache, blurred vision, nausea, vomiting, slurred speech, and mental confusion. Death, which can occur from high doses, results from respiratory arrest caused by muscle paralysis and bronchoconstriction. Accidental oral poisonings have resulted in death from doses between 50 and 500 mg/kg.

Diazinon has many metabolites, but toxicity data on most are not currently available. While the metabolite diazoxon is more toxic than diazinon, it is also more easily metabolized and excreted. Diazinon may exhibit synergistic effects with other commercial pesticide formulations currently in use. Diazinon is not considered to be a carcinogen and is nonmutagenic.

Animals differ in their sensitivity to diazinon, both within and between species. Toxicity varies widely and depends on sex and life stage (table 3). Diazinon is toxic to vertebrate laboratory animals and very toxic to livestock. Diazinon is extremely toxic to birds, which are sensitive because their blood has no enzymes to hydrolyze diazoxon (a toxic metabolite), as does mammalian blood

(Eisler, 1986). Signs of intoxication include salivation, stiff-legged gaits, wing spasms, and wing-beat convulsions (Hudson et al., 1984). Many incidents of avian (particularly geese and other waterfowl) mortality on golf courses have occurred because of the use of granular formulations of diazinon. These incidents led EPA to cancel use of diazinon on golf courses and sod farms in 1986. Some terrestrial invertebrates (such as bees) are extremely sensitive to diazinon. Diazinon causes high earthworm mortality but does not have a similar effect on nematodes.

Table 3.
Acute Oral LD_{50}s[1] for Selected Species Dosed with Diazinon (mg/kg)

Rabbit	130
Mouse	80 -135
Female rat	76 - 250
Male rat	108 - 285
Guinea pig	280
Calf	0.5
Starling	110
Mallard (3 to 4 months old)	3.5
Pheasant (3 to 4 months old)	4.3
Bobwhite quail	3.4 - 10
Chicken (5 days old)	8.4
Redwinged blackbird	2.0
Butterfly	8.8
Honey bee	0.372/bee

[1]LD_{50} = Lethal dose for 50% of animals treated

Freshwater cladocerans (water fleas, common to aquatic areas) are among the aquatic species most sensitive to diazinon; *Gammarus fasciatus* has a 96-hour LC_{50} of 0.20 grams per liter. There is some evidence that juvenile fish are more sensitive than eggs. Sublethal effects include reduced growth and reproduction in both marine and freshwater invertebrates, including reduced emergence of insects (Eisler, 1986). Algae are unaffected by concentrations fatal to aquatic invertebrates.

(iii) Exposure and Risk

Humans

Potential exposure to humans is by ingestion or dermal absorption. The soil drenching application (rate of 52 mg per square foot of treated area) techniques prevent inhalation exposure. Because the diazinon is watered into the soil and the drenched area is small, public exposure will be limited. Program use of the pesticide precludes exposure to residues from produce on host plants because any fruit will be stripped from the plants before treatment. Occupational exposure will be reduced by wearing gloves when handling or applying diazinon. The only human health risk associated with diazinon is the consumption of soil from the drenched area by toddlers. The public will be notified when a drench has occurred and will be advised of the necessary precautions.

Nontarget Species

Diazinon exposure to nontarget organisms is restricted to those organisms that traverse or visit the treated area as well as relatively immobile species that inhabit the area directly treated. The treatments are limited (generally less than 10 gallons per year) and occur only within the drip line of host trees. However, due to diazinon's high toxicity, organisms that are directly exposed are at high risk. Limiting exposure will reduce this risk.

Endangered and Threatened Species

Because birds are highly mobile and are among the most sensitive vertebrates to diazinon, endangered and threatened avian species are of special concern. No endangered or threatened species are known to exist within the current eradication zone. However, if the program were to expand, the limited nature of the soil treatments and implementation of appropriate protective measures would combine to protect federally listed endangered and threatened bird species.

Diazinon is used only to treat soil under hosts that are infested with Mexican fruit fly larvae. This means that very little is used in a program (usually less than 10 pounds annually, for a total area of under 2 acres). Therefore it is unlikely that endangered and threatened birds would even encounter any treatments.

Endangered and threatened birds may be protected from exposure to diazinon by physical barriers (plastic netting or burlap laid over the treated area while the pesticide is thoroughly watered into the soil) or otherwise excluded by program personnel who remain in the area until the pesticide has soaked into the soil. Program monitoring may include carcass searches to ensure that no endangered and threatened species are affected by the program. If there is any confirmation that the program has adversely affected an endangered and threatened species, immediate action would be taken to determine an appropriate program response that would be required to protect those species.

It is anticipated that swift initiation of eradication activities upon detection of a Mexican fruit fly infestation will minimize the area requiring treatment and make it unlikely that treatments will occur where endangered and threatened species are present. Recent Mexican fruit fly infestations have occurred in urban and suburban areas where natural areas are small and endangered and threatened species are few or absent. Additionally, the incorporation of protective measures should further protect endangered and threatened species from potential adverse effects attributable to program eradication activities.

c. Methyl Bromide Fumigation

(i) Fate

Methyl bromide is an odorless, colorless, volatile gas which is three times as heavy as air. Its half-life is 3 to 7 days. Methyl bromide is released when a fumigation chamber is aerated. Because methyl bromide is heavier than air, the gas can collect in isolated pockets, which could create hazardous conditions when there is little air circulation or mixing, such as during thermal inversions or periods of low wind.

(ii) Toxicity

Methyl bromide gas and liquid are acutely toxic to humans. Contact with liquid or vapors can cause serious skin or eye injury. Inhalation can cause acute illness, including pulmonary edema (fluid buildup in the lungs), gastrointestinal distress, and convulsions which can be fatal. The LD_{50} (lethal dose for 50% of animals treated) of rats to methyl bromide is 2,700 ppm for a 30-minute exposure. In humans, 1,583 ppm (6.2 mg/L (milligrams per liter)) methyl bromide is lethal after 10 to 20 hours of exposure and 7,890 ppm (30.9 mg/L) is lethal after 1½ hours of exposure (EPA, 1986). EPA has derived an RfC (reference concentration) of 0.48 mg/m^3 (milligrams per cubic meter) for general population exposure to methyl bromide (EPA, 1992). Methyl bromide is rapidly absorbed by the lungs and affects both the lungs and kidneys. Increased exposure to methyl bromide results in elevation of bromine levels in the blood; poisoning symptoms occur at a level of 2.8 mg/100 ml of blood (Curley, 1984). Symptoms of acute exposure typically are headache, dizziness, visual problems, gastrointestinal disturbances, and respiratory problems. In more extreme cases, muscular pain, numbness, or twitching precede convulsions, unconsciousness, and possibly death.

Chronic exposure can result in behavioral changes, loss of ability to walk, neurological damage, and renal and liver function disturbances (Verberk et al., 1979). Because there are a number of toxicity data gaps, the chronic and subchronic toxicity of methyl bromide is not well characterized. For this reason, and the implication of its contribution to ozone depletion, EPA has issued a call-in notice to provide this information for reregistration. Manufacturers must supply more information.

Based on laboratory studies of the effects of methyl bromide inhalation and ingestion, nontarget species of mammals and birds exhibit symptoms similar to humans: weakness, lack of muscular coordination, neurological and behavioral abnormalities, and death from high doses. Due to its restricted use as a fumigant, wild animals are rarely exposed to methyl bromide and toxicity data is limited to farm animals. Residues in hay ranging from 6,800 to 8,400 ppm caused symptoms of intoxication in cattle, horses, and goats (Knight and Costner, 1977).

(iii) Exposure and Risk

Humans

Inhalation is the primary exposure route for methyl bromide. Concentrations of methyl bromide are electronically monitored during the fumigation. Because the gas is odorless and nonirritating during exposure and the onset of symptoms is delayed, leaks and spills causing extreme exposure can occur without persons being aware of its presence. Protective clothing and self-contained breathing apparatus are worn whenever concentrations of methyl bromide are anticipated to reach or exceed 5 ppm. The American Conference of Governmental Industrial Hygienists (ACGIH) has established exposure standards (Threshold Limit Value) of 5 ppm (20 mg/m^3) to protect against adverse neurotoxic and pulmonary effects (ACGIH, 1990). Dermal exposure to workers could occur in the unlikely event of a spill of liquid methyl bromide.

Ingestion of methyl bromide residues and its degradation products is a third exposure route. Following aeration of the commodity, the small amount of methyl bromide that remains dissipates and degrades, leaving only inorganic bromide residues. However, residues from the methyl bromide fumigation will remain on the commodity. EPA tolerances for residues of methyl bromide, measured as inorganic bromides (40 CFR 180.123), range from 5 ppm (for apples, pears, and quinces) to 240 ppm (for popcorn), with most commodities at 50 ppm or less. Ingestion of these small amounts of residues is considered to have no toxicological effect.

The Natural Resources Defense Council has petitioned EPA to classify methyl bromide as a class I ozone depleting chemical; the petitioners also have requested reduction of its manufacture by 50% in 1992, and complete elimination of manufacture by January 1, 1993. The relative importance of methyl bromide to ozone depletion, however, is subject to fundamental uncertainties.

Workers will have little exposure to methyl bromide because fumigations are contained. The public will be restricted from access to the fumigation chamber by a 30-foot wide barrier zone. Residues in fumigated commodities will be within tolerance limits. There is very little risk to human health from a methyl bromide fumigation.

Nontarget Species

Few nontarget species will be exposed to methyl bromide directly. The aeration duct will deliver a plume which will disperse quickly. Species within this plume, such as insects which inadvertently fly in, might die. However, these effects are restricted to areas within the 30-foot wide barrier zone (Bergsten, personal communication). In addition, ground-dwelling organisms immediately outside the fumigation chamber are not anticipated to survive.

Endangered and Threatened Species

Fumigation chambers are generally located in high traffic areas; tarped fumigations occur in agricultural areas. These areas are highly disturbed and are very unlikely to harbor endangered and threatened species. Therefore, it is not likely that endangered or threatened species will be exposed to methyl bromide fumigation.

3. Integrated Pest Manage-ment (Preferred Alternative)

The components of the program which will potentially have the greatest impact on the environment are the chemical pesticides. The environmental consequences from the use of these pesticides (malathion, diazinon, and methyl bromide) have been discussed above. Additional nonchemical methods are considered below.

a. Human Health

The risks from integrated pest management (IPM) include those discussed in the chemical control alternative as well as those associated with sterile insect technique, physical control, cultural control, and regulatory control. The sterile insect technique, physical control, and cultural control do not pose a risk to human health. The regulatory control program includes the same chemical control methods described in the chemical control alternative. In general, the use of nonchemical methods in a systems approach in IPM will reduce substantially the need for chemical applications, thereby decreasing the magnitude of impact from chemical usage.

b. Nontarget Species

The nonchemical techniques that may be employed in an IPM program could cause physical disturbance to nontarget species, due to noise or mere human presence. In general, little risk is associated with these disturbances. Sterile insect technique could have a positive effect, that of providing a food source to some insectivores. The alternative of IPM, because it uses a variety of integrated techniques, will result in less pesticide use than the other alternatives. The vast majority of program risk and potential consequences result from pesticides. Therefore, the IPM alternative is preferred because the fewest negative impacts are anticipated from its implementation.

c. Endangered and Threatened Species

Other than potential effects previously described, nonchemical treatment methods should not directly impact endangered or threatened species. The FWS has determined that the sterile insect technique is compatible with endangered or threatened species.

V. Cumulative Impacts

Cumulative impacts are those impacts, either direct or indirect, that result from incremental impact of the program action when added to other past, present, and reasonably foreseeable future actions. It is difficult to quantitatively predict the cumulative impacts for a potential emergency program in an environmental assessment such as this. The impacts can be considered from a subjective perspective.

Some chemicals, when used together, have been shown to act in a manner that produces greater toxicity than would be expected from the addition of both. This effect is known as potentiation or synergism. Malathion bait spray and diazinon could be applied during the same treatment regimen. Because malathion has frequently been observed as one constituent of a potentiating pair of organophosphorus insecticides (Murphy, 1980), synergistic effects from the combination of malathion and diazinon (both organophosphorus insecticides) could occur. However, malathion bait spray is applied to the tree canopy and diazinon to the soil within the drip line of the canopy, so synergistic effects are limited to animals that are active on both foliage and soil. In addition, the restriction of diazinon treatments to plants with infested fruits make it unlikely that any animals would get concurrent exposure to both insecticides.

Implementation of the program is expected to be temporary, lasting only until the infestation is eradicated. No bioaccumulation or environmental accumulation of malathion bait spray is foreseen due to its rapid degradation rate. Residues of diazinon should not persist, although short-term accumulation is possible. Therefore, the cumulative impacts of the program are expected to be less than those that might occur under the no action alternative, an alternative which most likely would result in escalating use of pesticides by the public.

Because the eradication may require the simultaneous use of malathion bait spray and diazinon, both of which are organophosphate cholinesterase inhibitors, there could be cumulative effects of using two pesticides. The history of the eradication efforts for the Mexican fruit fly, as well as other fruit fly species, shows that this use pattern does not result in adverse effects to the general resident population nor the workers. Because most nontarget species are mobile, it is unlikely that an individual will be exposed to more than one treatment. In addition, diazinon treatments are restricted to locations where Mexican fruit fly larvae are detected. Domestic animals and less mobile organisms, such as those dwelling near the soil surface, could be exposed.

In terms of the cumulative effects of pesticide use from the proposed action with pesticide use from other fruit fly programs, the small region requiring treatment for this program should not substantially increase exposure to workers, public, or nontarget species.

VI. Methods to Reduce Risk

Human pesticide exposure would be primarily to workers, especially in the case of the soil drench pesticide, diazinon, or methyl bromide which is used only in certified fumigation chambers or under tarpaulins (enclosures). Residents within the eradication area will be exposed to malathion bait spray and diazinon to an extent depending on where the pesticides are applied. The public could be exposed to residues on any treated material moved out of the eradication area.

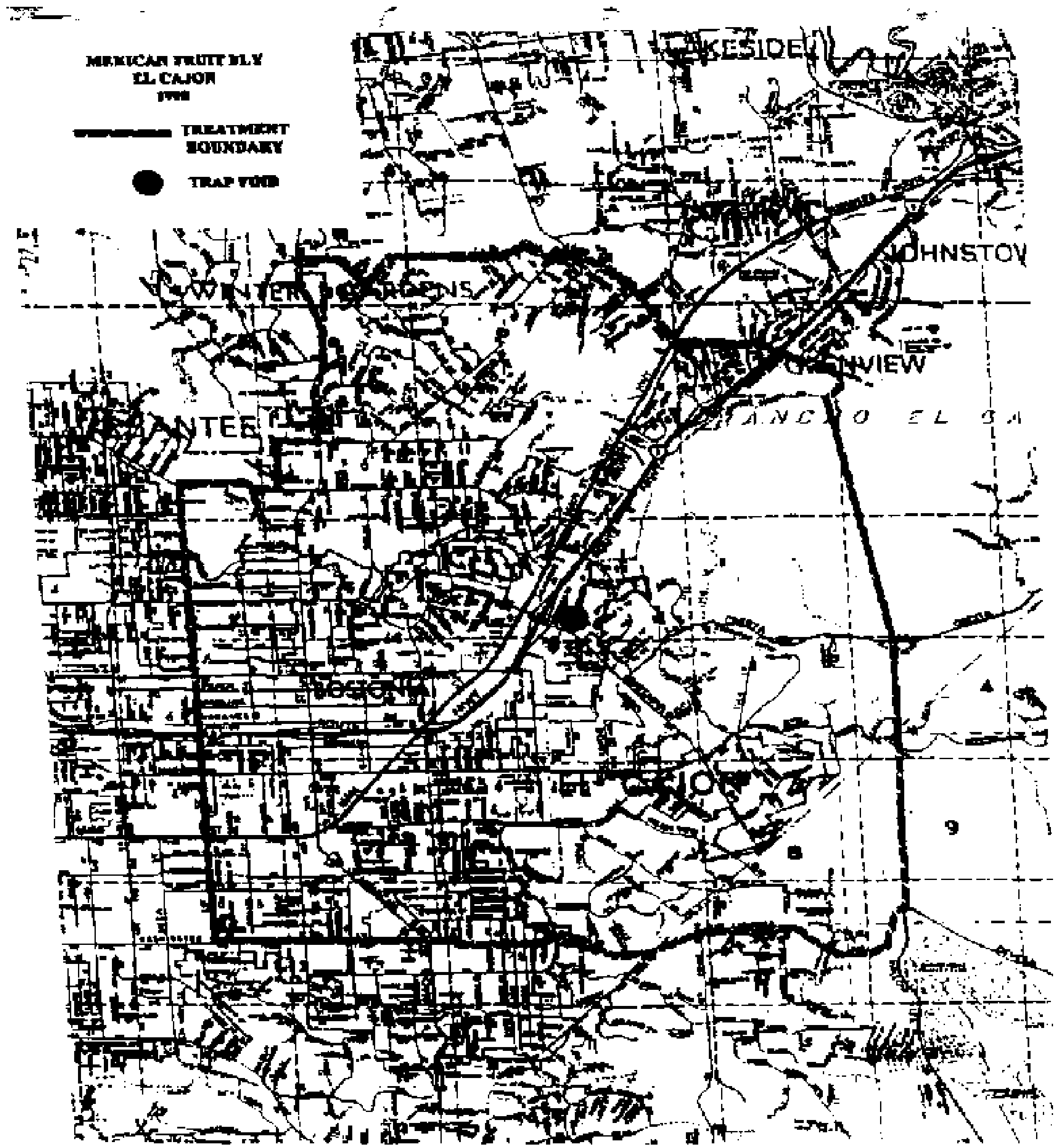
Current worker safety measures protect fumigators and other pesticide applicators from excessive exposure to methyl bromide, diazinon, and malathion during routine operations. To minimize worker exposure to methyl bromide, the fumigation chamber is opened only after concentrations are reduced below 5 ppm. Proper sealing of fumigation enclosures and proper aeration facilitates dispersal of the fumigant. Diazinon exposure of workers can be prevented by gloves and safety goggles, which are indicated as protective clothing requirements on the label (Meister, 1990). Studies on exposure to diazinon during yard applications reveal that 85% of the exposure to workers is to their hands. Dermal exposure of workers to malathion can also be substantially reduced by the use of protective clothing.

Written public notification will provide information about the schedule for pesticide treatments and applications, and specific precautions that residents should take to avoid excessive exposure, such as remaining indoors during malathion bait spray applications or diazinon soil treatments, and that malathion-treated produce should not be harvested for 3 days after application. However, individuals with greater sensitivity to cholinesterase inhibitors or the protein bait may need to take extra precautions to avoid even minimal exposure.

The program, properly executed, represents a relatively low risk to human health except for extremely sensitive individuals who have had problems with similar programs in the past. However, this assessment does contain uncertainties associated with toxicity data gaps and estimations of exposure. Furthermore, synergistic interactions between the pesticides which could be used in this program as well as other pesticides not associated with the program and possibly used in the same area could increase toxicity and the associated risk. Potential risk will be substantially diminished due to the localized nature and short duration of the program.

Risks to nontarget organisms can be reduced by limiting exposure. If aerial applications are conducted, beekeepers and backyard pond owners should be notified. A survey of water bodies within the treatment area should be conducted and mapped so they will be avoided by establishing “no treatment” zones during aerial operations. Ground application of malathion bait spray poses little direct risk. Pet owners should be notified to limit animals’ exposure to treated trees. Soil treatments pose more risk due to higher toxicities. To limit exposure, a barrier or other safeguards should be used. Timing of the treatment should be considered to reduce exposure. Standard operating procedures for methyl bromide fumigations include fencing or roping off the fumigation and aeration area, which precludes exposure of many vertebrates. The FWS or the California Natural Diversity Data Base will be consulted if the program area is expanded to ensure that endangered or threatened species are not adversely impacted.

Fig. 1—Map of Eradication Zone



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Appendix B. Consultation

The following agencies were consulted during the preparation of this environmental assessment:

California Department of Food and Agriculture
Department of Plant Industry
Sacramento, California

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Program Support
Riverdale, Maryland

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Policy and Program Development
Environmental Analysis and Documentation
Riverdale, Maryland

Finding of No Significant Impact
for
Mexican Fruit Fly Cooperative Eradication Program
El Cajon (San Diego County), California
Environmental Assessment,
July 1998

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), has prepared an environmental assessment (EA) that analyzes potential environmental consequences of alternatives for eradication of the Mexican fruit fly, an exotic agricultural pest that has been found in the El Cajon area of San Diego County, California. The EA, incorporated by reference in this document, is available from—

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Western Regional Office
9580 Micron Avenue, Suite 1
Sacramento, CA 95827

or

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Program Support
4700 River Road, Unit 134
Riverdale, MD 20737-1234

The EA analyzed alternatives of (1) no action, (2) chemical control, and (3) integrated pest management (the preferred alternative). Each alternative was determined to have potential environmental consequences. Integrated pest management was preferred because of its capability to achieve the eradication objective in a way that reduces the magnitude of those potential environmental consequences. Program standard operational procedures and mitigative measures serve to negate or reduce the potential environmental consequences of this program.

APHIS has determined that there would be no signficant impact to the human environment from the implementation of the preferred alternative, integrated pest management. APHIS' Finding of No Significant Impact for this program was based upon the limited nature of the program and its expected environmental consequences, as analyzed in the EA. In addition, APHIS anticipates no adverse impacts to threatened or endangered species or their habitats from this regulatory action. I find that the environmental process undertaken for this program is entirely consistent with the principles of “environmental justice,” as expressed in Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.”

Lastly, because I have not found evidence of significant environmental impact associated with the proposed program, I further find that an environmental impact statement does not need to be prepared and that proposed integrated pest management program may be implemented.

/S/
Helene Wright
State Plant Health Director - California
Plant Protection and Quarantine
Animal and Plant Health Inspection Service

August 3, 1998
Date